SOME CRETACEOUS BEDS OF ROGUE RIVER VALLEY OREGON.

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INTRODUCTION.

In the summer of 1894 a large part of the months of June and July was spent by the writer in studying the Cretaceous beds of southern Oregon.[1] The deposits most thoroughly worked lie in the portion of Rogue River Valley west and southwest of Jacksonville, extending to the summit of the Siskiyous where these are crossed by the Oregon and California Railway. This region is more strictly an arm of what is commonly known as Rogue River Valley, and may, for the purpose of the present paper, better be called the Bear Creek Valley. Its general direction is northwest and southeast. It lies between the high granitic ridges of the Siskiyous on the southwest and the southern portion of the Cascade range on the east. The upper portion of the valley, near where the railway crosses the summit, is not far from the point where the Siskiyous join the Cascades. From this point the valley widens gracefully into the deep basin,

[1] The data obtained were studied at the laboratory of Stanford University, where much of the material collected is preserved.

into which one may look down from the cars when near the little station of Siskiyou. Two or three miles below the town of Ashland some granitic ridges from the south come down abruptly to the creek, almost severing this upper portion of the valley from the main valley beyond. West and northwest of these ridges the valley expands again until, in the vicinity of Medford, its width is from eight to ten miles, while from this point to the summit just mentioned the distance is something like twenty-five miles. In this valley the Cretaceous beds appear mainly on the eastern side, or on the side east of Bear Creek, and probably also occupy the floor of the valley where they are overlain by Pleistocene deposits.

It has been thought that these beds, which are of Upper Cretaceous or Chico age, extend indefinitely eastward under the lavas of the Cascades.[1] It cannot be said, however, that the facts observed during this study confirm this opinion. On the contrary, the true relation of the sedimentary rocks here described to the rocks of the Cascades is so apparent and so uniform that one cannot fail to be convinced that at least this portion of the Cascade range is older than the Chico portion of the Cretaceous.

PRE-CRETACEOUS.

Underlying the Cretaceous are three distinct series of rocks which may be called the granite series (including the schists), the basalt series and the slate series. The point of junction between these series is probably not far from the town of Talent; and from this point lines separating approximately the three pre-Cretaceous series may be drawn as follows: Toward the southeast the general course of Bear Creek or, still better, an irregular line between that and the line of the railway divides the granite on the west from the basalt on the east; toward the southwest the line separating the granite on the south from the slates on the northwest follows the course of Wagner Creek southward for a mile or more, then swings toward the west and

[1] Geol. Sur. Cal., Vol. I., p. 354. Seventh An. Rep. U. S. Geol. Sur., p. 98. U. S. Geol. Sur., Bull. 33, p. 20.

follows the upper portion of Anderson Creek to its head; from Talent the line between the slates on the west, and the basalt on the east, runs in a northerly direction.

Each region and each series has its own distinguishing characteristics. The rocks of the granite series are made up of massive granites and of folded and contorted schists. No attempt was made to separate these in working out the areal geology. The peaks and ridges of this area are high and rugged, and the canyons are deep and generally heavily timbered with spruce and pine.

The slates, which are no doubt a northward continuation of the auriferous slates of California, portions of which they closely resemble, are variable in character. In some places they are dark, fine grained and argillaceous; in other places they are micaceous, talcose or shaley with large masses of quartzite. Where they are auriferous they often contain numerous small and irregular veins of quartz. The mountains of the slate area are less rugged, often low and less heavily timbered than those of the granite area.

The area of basaltic rocks is also well characterized by regular and rolling hills which are generally not deeply eroded, and in which the rocks seem to be more uniform. These basaltic hills form the western edge of the Cascade range at this point. For the most part they consist of old basalts, andesites and other basic eruptives.[1]

Upon each of these series of rocks the Cretaceous strata rest with equal distinctness, and with equal absence of metamorphism, or alteration, other than what would be expected from weathering. The only case of alteration that was observed in these rocks is in the immediate vicinity of dikes of limited extent, which have made their way through the strata at various places, often without disturbing the regular position of the beds. In such cases the alteration is confined to a few feet or yards on each side of the intruding mass. As far as is known the dikes occur mostly along the line of junction between the granite and the basalt.

[1] Seventh An. Rep. U. S. Geol. Sur., p. 98.

CRETACEOUS.

Transgression.—It has been pointed out by Mr. J. S. Diller[1] that in the region of northern California and southern Oregon, during the deposition of the Cretaceous strata, a gradual subsidence of the land carried the eastern shore-line inland. In California this transgression of the sea was toward the northeast while in southern Oregon it was generally toward the southeast The facts observed in that portion of Rogue River Valley under discussion may conform to this rule in the main, but being in the more immediate neighborhood of the Siskiyous, they may indicate, also, a subsequent elevation of this range relative to the Cascades. The strata consist of heavy beds of conglomerates, shales, and sandstones which generally dip toward the northeast at an angle varying from 10° to 30°.

The fauna of the Cretaceous at Riddles, Douglas county, Oregon, which is about sixty miles to the northwest, shows a much lower horizon for those beds than is indicated by any fossils yet found in this valley. Deposition was therefore going on at Riddles before the Rogue River Valley was submerged.

STRATIGRAPHY OF THE CRETACEOUS.

As the strata generally dip toward the north, away from the granites of the Siskiyous, as shown by the accompanying sections, the lower and older strata appear along the western flank of the valley. However, for the most part the strata are destitute of fossils. This remark applies to the upper beds which occupy the eastern side of the valley, but which, from their lithology, dip, etc., are known to be conformable and continuous with the fossiliferous beds to the west. They are probably equivalent to the barren Chico beds of northern California. Thus far fossils have been found only along the western side of the valley; though along this side, from the summit where the railway crosses, northwestwardly to Jacksonville, fossils are rather abundant. Three localities, besides the two mentioned by Gabb, have furnished fossils of a varied and interesting character.

[1] Bull. Geol. Soc. Am., V., 452.

Ashland locality.—About four miles south of Ashland, near the railway, the following species have been collected:

Pachydiscus aff. denisonianum, Stol.
Cinulia obliqua, Gabb.
Fasciolaria rigida, Bailey.
Gyrodes pansus, Stol.
Pugnellus manubriatus, Gabb.
Cucullæa truncata, Gabb.
Chione varians, Gabb.
Cyprimeria lens, Gabb.
Homomya concentrica, Gabb.

This indicates an upper horizon for these beds, but not the uppermost Chico. The beds here are of a grayish, or light-colored sandstone, dipping toward the east at an angle of about 30°. A short distance to the south, where the sandstone is quarried on the east side of the railway, the beds are thicker and of a light grayish color; they also dip toward the east at about the same angle.

Griffin Creek.—Collections made at a second locality on Griffin Creek. a few miles east of Jacksonville, contain the following species:

Trigonia leana, Gabb.
T. tryoniana, Gabb (?).
Exogyra, sp.
Inoceramus, sp.

Here the beds are of a tawny or grayish sandstone, and dip at an angle of 20° toward the west and northwest. These strata, as at Jacksonville, a few miles to the west, rest upon the highly tilted or folded auriferous slates. The fossils indicate a horizon a very little lower than the beds near Ashland.

'49–Mines.—A third locality, at which the largest and most interesting collection was made, is one and one-half miles southwest of the town of Phœnix, at the old placer mines, locally known as the '49-Mines. Here also the Cretaceous beds consist of conglomerates, yellow shales, and sandstones, resting upon the auriferous slates and dipping toward the northeast at an angle of 30°. The fossils collected at this point show these beds to be somewhat lower than those before mentioned, although some of the fossils belong to the upper Chico of the California Cretaceous. The following is a list of the fossils identified from this locality:

Acanthoceras, aff. naviculare, Mant.
Pachydiscus, aff. denisonianus, Stol.
Gaudryceras, aff. timotheanum, Mayor.
Lytoceras, conf. jukesi (Sharpe)—— Whiteaves.
Phylloceras ramosum, Meek.
Scaphites, sp. a.
Scaphites, sp. b.
Schloenbachia chicoensis (Trask) Gabb
Schloenbachia inflata, Sow.
Schloenbachia propinqua, Stol.
Schloenbachia, conf. serrato-carinata, Stol.
Schloenbachia, sp.
Nautilus, aff. rota, Blanford.
Baculites, sp.
Hamites, sp.
Heteroceras, sp.
Actæonina californica, Gabb.
Anchura californica, Gabb.
Anchura falciformis, Gabb.
Cinulia obliqua, Gabb.
Cinulia, sp.
Dentalium stramineum, Gabb.
Euspira, aff. pagoda, Forbes.
Fulgur hilgardi, White.
Fulguraria gabbi, White.
Globichoncha remondi, Gabb.
Gyrodes conradiana, Gabb.
Gyrodes pansus, Stol.
Gyrodes, sp.
Margaritella globosa, Gabb.
Avicula nitida, Forbes.
Cardium remondianum, Gabb.
Chione varians, Gabb.
Cucullæa truncata, Gabb.
Cyprimeria lens, Gabb.
Exogyra, sp.
Exogyra, sp.
Homomya concentrica, Gabb.
Inoceramus labiatus, Schloth.
Inoceramus, sp. a.
Inoceramus, sp. b.
Meretrix nitida, Gabb.
Modiola siskiyouensis, Gabb.
Ostrea, sp.
Pectunculus veatchi, Gabb.
Pectunculus sagittata (?), Gabb.
Pinna breweri, Gabb.
Tellina parilis, Gabb.
Teredo, sp.
Trigonia evansana, Meek.

STRUCTURE.

Sections.—The section shown in Fig. 1 is approximately in the direction of the dip drawn through the vicinity of the '49-Mines in a northeasterly direction. Toward the western end, as has been said, the Cretaceous strata rest directly upon the auriferous slates, and dip more nearly toward the north, at an angle of 30°. In the bottom of the valley they are covered by Pleistocene deposits, but appear again where the erosion of Bear Creek has exposed them. From this point, one travels across the upturned edges of the beds to near the summit of the mountain. The dip is pretty uniform for the greater part of the section, but toward the eastern end it is somewhat less steep.

Just east of Bear Creek the first low range of hills is formed

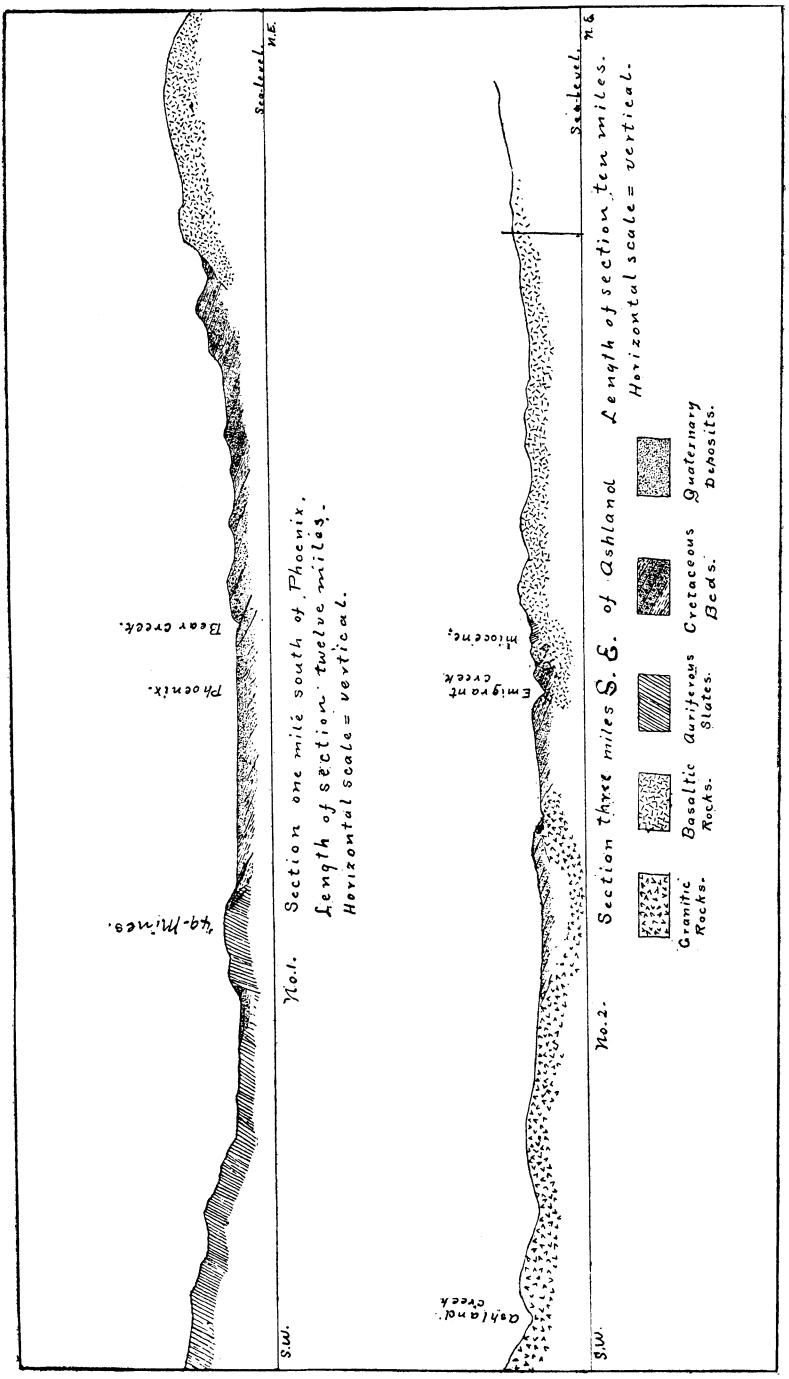
mainly of a coarse pebbly conglomerate, the material of which is of doubtful origin, many of the larger pebbles being quartzose and much worn and rounded. These are succeeded by soft, yellow shales, with sandy layers, and these again by pebbly sandstone, until near the eastern extremity of the section where the strata consist of more massive sandstone with a somewhat gentler dip. These sandstones rest directly upon the old eruptives that form this spur of the Cascades. The contact, which is distinct in numerous places, shows no signs of alteration in the sandstone resulting from their contact with the lavas, nor are the lavas anywhere found resting upon the Cretaceous rocks.

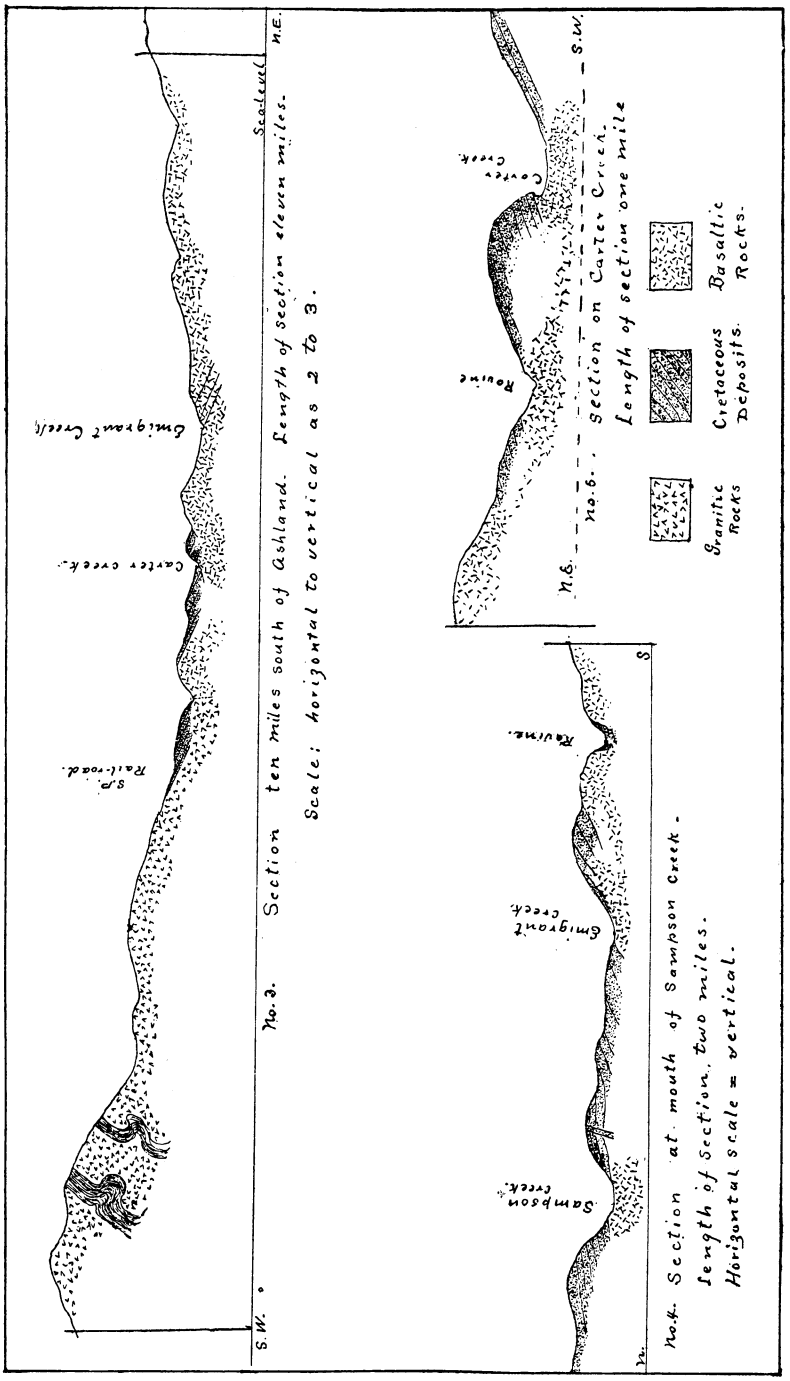
Figure 2 shows a section drawn in a northeasterly direction through the locality at which fossils were found four miles south of Ashland. This locality is at the western extremity of this section. Here the Cretaceous beds rest upon the granite of the adjoining ridge from which they dip away at an angle of 30°.

In the bottom of the valley the granite again emerges from beneath the sedimentary rocks, and is replaced at Emigrant Creek by the pre-Cretaceous lavas upon which the Cretaceous strata rest along the sides of the mountain. Farther up the mountain toward the east the lavas again make their appearance, and continue toward the summit without interruption; but a few hundred yards above the limit of the Cretaceous beds they (the lavas) are covered for a short distance by a remnant of white Miocene shale, apparently of fresh-water origin. These shales contain an abundance of fossil plants, some species of which were identified by F. H. Knowlton, as follows:

Myrica langeana (?), Heer.	Alnus corralina, Lx.
Sequoia langsdorfii, Brgt.	Quercus lonchitis, Ung.
Lastræa fischeri, Heer.	Quercus n. sp.
Planera, sp.	Andromeda, sp.

Still farther toward the south, in the vicinity of Wagner's Soda Springs, the Cretaceous beds have the same general dip of 30° to the northeast and bear the same relation to the granite on the west and to the old eruptions on the east (see section in Fig. 3). Toward the western end of the section the


Sea level N.E.
S.W.
Ya-Mines.
Phoenix.
Bear creek.
No. 1. Section one mile south of Phoenix.
Length of section twelve miles.
Horizontal scale = vertical.
Ashland creek
Emigrant creek
Miocene.
Sea level N.E.
S.W.
No. 2. Section three miles S. E. of Ashland
Length of section ten miles.
Horizontal scale = vertical.
Granitic Rocks.
Basaltic Rocks.
Auriferous Slates.
Cretaceous Beds.
Quaternary Deposits.


S.W.
S.P. Rail-road.
Carter creek.
Emigrant Creek
Sea-level
N.E.
No. 3. Section ten miles south of Ashland. Length of section eleven miles.
Scale: horizontal to vertical as 2 to 3.
N.S.
Rouine
Carter Creek
S.W.
No. 6. Section on Carter Creek.
Length of section one mile
Granitic Rocks
Cretaceous Deposits.
Basaltic Rocks.
Rouine.
Emigrant creek.
Sampson creek.
S.
No. 4. Section at mouth of Sampson Creek.
Length of Section, two miles.
Horizontal scale = vertical.

Cretaceous sandstone rests directly upon and covers the granite, which, however, makes its appearance again in the bottom of a deep ravine a few hundred yards to the east. The basic rocks come to the surface almost in contact with the granite and continue to the summit of the low ridge eastward, where they are covered by the Cretaceous sandstones. These sandstones extend from this point for a distance of a mile or more; beneath them the igneous rocks again appear in the canyon of Carter Creek From this place they continue eastward indefinitely.

Figures 4 and 5 represent, on a larger scale, some sections at points in the vicinity of Wagner's Soda Springs.

Figure 4 is a north-south section across Sampson Creek a short distance from its mouth. The sides of the canyon are of Cretaceous sandstone, which has been eroded by the stream down to the older basic rocks which here underlie it.

Figure 5 is a northeast-southwest section across Carter Creek one mile north of Smith's Soda Springs. In the bed and on both banks of the creek the rocks are the basic eruptives which, at twenty feet from the stream, on the east bank, show clearly their contact with the sandstones which project over them. These sandstones form the whole of the ridge toward the east, until, in the bottom of the next ravine, half a mile to the northeast, the older lavas again make their appearance.

Thickness of the beds.—It is not easy to say what the original thickness of these beds has been, but the estimated thickness of those remaining is between ten thousand and fifteen thousand feet.

Coal beds.—At various places along the eastern side of the valley small beds of coal are occasionally found. They are the mere remnants of beds once more extensive; they are thin and of no economic importance.

Faults.—Although in some of the accompanying sections there is a suggestion of faulting along the line of Bear Creek, there is no evidence that this is the case. The strata have a uniform dip on both sides of the valley, and those found along the western side are nowhere represented on the eastern. No fossils

except plants have been found east of Bear Creek. The sedimentation was apparently continuous, and the beds are unbroken along the whole length of the section.

Subsidence.—As far as is known all the beds of this region are of younger age than those at Riddles, Douglas county, farther to the northwest, which have been described by Mr. Diller and Mr. Stanton,[1] and which seem to be of Upper Knoxville age. This, as they have shown, indicates a general subsidence of the land toward the southeast.

Elevation.—Glancing again at the accompanying sections, it seems remarkable that the steep and uniform dip of the strata can be accounted for by a subsidence of the land along the eastern shore-line. On the flanks of the Siskiyous, notably near the railway tunnel at the summit, at an elevation of 4000 feet, fossils are found which indicate a lower horizon than that of the barren sandstones upon the basaltic area a few miles to the northeast, at a much lower elevation. The Miocene strata known in this region also dip at a high angle away from the granite of the Siskiyous, which would not be expected without some movement subsequent to their deposition. This elevation, then, probably took place about the time of the general outpouring of the lava which covers eastern Oregon from the Columbia River south, and northern California. This lava, as has been shown by Professor Le Conte and others, is later than the Miocene.[2]

NOTES ON THE FOSSILS.

Horizon.—Although the fossils collected near Phœnix were all obtained from an area of less than one hundred feet square, it is not clear that they are all from the same horizon. A glance at the section, Fig. 1, will show that an immense thickness of strata has been removed at the locality at which the fossils were found. The fossils may not all have been in their original places, as they were found mainly in blocks of hard rock resting irregularly upon

[1] Bull. Geol. Soc. Am., V., 452.

[2] Am. Jour. Sci., VII., 1874, 176. Geol. Sur. Cal., I., 354. U. S. Geol. Sur. Bull., No. 33, 20.

a stratum of softer, yellow shale. These blocks are probably the remnants of overlying strata which have been removed. Many of the fossils, hitherto not cited from this coast, were submitted to Mr. T. W. Stanton, to whom the writer is indebted for many valuable suggestions.

Acanthoceras, conf. *naviculare*, Mant.; Geol. of Sussex, 198, t. 22; Min. Conch, p. 105, t. 555; Cret. Ceph. Ind., p. 73, pl. 39.

Two specimens of this shell were collected and, although not perfect, there can be little doubt that it is closely related to *A. navicularis*. It agrees remarkably well with Blanford's description and figure, and also the description and figure by Sharpe, with the exception of the tubercles at the umbilical end of the longer costæ. Blanford, however, remarks that these are not always present even in young specimens, in which they are usually more constant. The sutures, as far as they can be traced, leave little room to doubt the identity of this species.

Pacydiscus, aff. *denisonianus*, Stol.; Cret. Ceph. Ind., p. 133, pl. 66.

Three specimens of this ammonite were found, one of which is in good state of preservation. The only essential differences that can be seen between this shell and those described from the Cretaceous of southern India is in the slightly greater thickness, and a little wider umbilicus in older specimens of the Indian species.

Gaudryceras, sp.

Four specimens were obtained in good state of preservation, two of which are nearly two inches in diameter. While in some respects this shell resembles *G. timotheanum*, Mayor, the whorls are more rounded and not so thick. One of the smaller specimens and a fragment of another show the squarish whorls, but all of them lack the transverse furrows.

Lytoceras, conf. *jukesi?* (Sharpe), Whiteaves; Pal. Sus., V. 8, p. 53, pl. 23; Can. Mess. Foss., Vol. I., Part 2, p. 111, pl. 13.

A single, well-preserved specimen of this fossil, about one inch in diameter, was found. It agrees fairly well with Whiteaves' description referred to above, with the exception of the trans-

verse ridges. There are, however, slight markings that indicate a periodical interruption of growth.

Schloenbachia chicoensis (*?*), (Trask), Gabb; Proc. Cal. Acad. Sci., 1856, Vol. I., p. 92, pl. 2; Cal. Pal., Vol. I., p. 68, pls. 13 and 14.

A number of specimens were collected of a species closely resembling *A. chicoensis* figured by Gabb, as do also most of the specimens that I have seen from California. It is, however, doubtful if these and Dr. Trask's figures represent the same species.

Schloenbachia inflata, Sow; Min. Conch., II., 1878; Cret. Ceph. Ind., 48, pl. 28 and 29; Can. Mess. Foss., VII., I., part 3, 200.

One specimen five inches in diameter in fair state of preservation, and a large number of smaller ones of this species, varying from one-half to one and one-half inches in diameter, were obtained. The smaller ones are all well preserved.

Schloenbachia propinqua, Stol.; Cret. Ceph. Ind., 53, pl. 31; Can. Mess. Foss., II., Part 3, 247, pl. 33.

One specimen two inches in diameter and a large number of smaller ones, one-half to three-fourths inch in diameter, with numerous fragments of various sizes, all in good preservation, were collected. This fossil, with its numerous bifurcating ribs, tubercles, rounded outer margin, undoubtedly represents the species to which it is here assigned.

Schloenbachia, conf. *serrato-carinata*, Stol.; Cret. Ceph. Ind., 57, pl. 32.

A number of fossils, one-half to one and one-half inches in diameter were collected, which seem to be of this species. In most respects they agree quite well with Stoliczka's figure, but seem to be less deeply grooved along each side of the keel; yet he remarks that the grooves are not so deep as figured. In the specimens collected the keel is prominent, and in some of the specimens serrated, while in others it is not. A double row of tubercles near the outer margin ornament the ribs.

Nautilus, conf. *rota*, Blanford; Cret. Ceph. Ind., 38, pls. 24 and 25.

Two specimens of this species were found, one of which, after breaking away the outer whorl, furnished a specimen two inches in greater diameter. The edges of the septa are distinct and show the characteristic curves. It has also the closed umbilicus and narrower ventral margin and outline of *N. rota*, but is rather narrower and has not the surface markings. The larger specimen resembles *N. texanus* (*?*), (Shum), Gabb. It is possible that this species of Gabb will eventually prove to be identical with *N. rota*, Blanford.

Gyrodes pansus, Stol.; Cret. Gastr. Ind., 305, pl. 22.

Six specimens of this fossil were found all in fair preservation and two of which were exceptionally good. The characteristic markings, low spire and outline all indicate that there can be no doubt of its proper identification.

Avicula nitida, Forbes; Trans. Geol. Soc. Lond., VII., 151; Peleo. Ind., 404, pl. 24.

Six specimens were collected of this shell which show clearly all the characteristic features of the species. The fossils are all well preserved.

Inoceramus labiatus, Schloch; Bronn's Jahrb., VII., 93; Proc. Acad. Sci. Phil., 1857, 119; Can. Mes. Foss., I., part 3, 193; U. S. Geol. Sur. Bull., 106, 77, pl. 14.

Ten quite perfect half-shells, besides a large number of fragments of this species were obtained. The shells agree so well with Meek's description that there can be no room for any other reference.

Pectunculus sagittata (*?*), Gabb; Cal. Pal., I., 197, pl. 131; U. S. Geol. Sur. Bull., No. 51, 39.

A number of specimens of this shell were found in very good preservation, which resemble very closely *P. subplantata*, Stol., but being uncertain as to their identity with this species, I have preferred to refer them to *P. sagittata*, Gabb, in view of what has been said by Professor White as to the absence of the sagittate markings.

F. M. ANDERSON.

STANFORD UNIVERSITY,
California, May 8, 1895.